Introduction

Occupational health is the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations. It could be achieved by controlling risks and the adaptation of work environment to people, and their jobs. It is essentially meaning services by preventive functions and responsible for advising the employer, the workers and their representatives in the .undertaking on control risks. It caused by optimal physical and mental health in relation to work the adaptation of work to the capabilities of workers in the light of their state of physical and mental health ***(Manali, 2009).***

Occupational health and diseases are complex issues. To better protect the workforce, it needs greater understanding of the relationship among employers, trade unions, healthcare professionals and the public. However, it is important to note that there are various hazards encountered at work (e.g. physical factors, chemical and biological agents, adverse ergonomic conditions, complex safety risks, and various psychosocial factors). All these factors contribute to what is known as occupational diseases ***Milton (2009)***.

According to ***International Labor Organization (ILO) (2013)*** about two million people die every year from work-related accidents and diseases. Also, an estimated 160 million

people suffer from work-related diseases. Moreover, there are an estimated 270 million fatal and non-fatal work-related accidents per year. The suffering caused by such accidents and illnesses to workers and their families are incalculable. In economic terms, the ***(ILO, 2013)*** has estimated that 4% of the world's annual Gross Domestic Product (GDP) is lost as a consequence of occupational diseases and related accidents. Even more, employers face costly early retirements, loss of skilled staff, absenteeism, and high insurance premiums due to work-related accidents and diseases**.**

Workers involved in municipal waste disposal and handling face occupational health and safety hazards which are as diverse as the materials they are handling. Workers' primary complaints relate to odor and upper respiratory tract irritation usually related to dust. However, actual occupational health and safety concerns vary with the work process and the waste stream characteristics (mixed municipal solid waste (MSW), sanitary and biological waste, recycled wastes, agricultural and food wastes, ash, construction debris and industrial wastes). Biological agents such as bacteria, endotoxins and fungi may present hazards, particularly for immune system-compromised and hypersensitive workers ***(Platner and James, 2011)***.

Regarding the importance of morbidities detected among waste collection workers (WCWs) in USA (2004), the morbidity profile of WCWs was under Bangalore City

Corporation. The major ailments encountered were hypertension (18.9%), respiratory ailments (7.78%) and skin ailments (3.11%). The prevalence of Hepatitis A Virus (HAV) infection among WCWs was 27%**.** While, in India anemia represented 20.5%, hypertension 9.5%, upper respiratory tract infections (URTI) 7.3% and chronic bronchitis 5.9% ***(Sabde and Zodpey, 2008).*** In Egypt, waste collectors workers who suffer from high percentage of musculoskeletal complaints presented 60.8%, while the most frequently affected body region were lower back 22.5%; shoulders 15.8%; neck 7.5%; knee 6.7% and hips/thighs and elbows 5.8% ***(Abou-ElWafa, 2012).***

Waste collection is one of the components of waste management, which results in the passage of a waste material from the source of production to either the point of treatment or final disposal. However, the risk of disease resulting from exposure to various work hazards is high, including the risk of fatal and non-fatal occupational accidents. Waste collection can be practiced either as an occupation or an essential means of survival. Meanwhile, the socioeconomic status of waste collectors is low, and their working environment is unfavorable. Therefore, many preventative measures have been proposed and implemented in the occupational settings in order to reduce the risk of accidents and occupational diseases. (***Silva, Fassa, Siqueira and Kriebel, 2005).***

Preventive measures are strategies aim at eliminating or reducing the occurrence of hazardous agents and factors in the work environment to an acceptable levels, preferably at their source of generation, secondly during their path of transmission and lastly by protecting the worker. Modifications include, correct operation and maintenance of processes and equipment, enclosures and closed systems, good work practices, as well as personal protective equipment. Information, training and education of workers and employers regarding hazards and their prevention (including an emergency response) should also be part of such strategies in order to ensure the continued efficiency of preventive measures ***(WHO, 2013).***

Significance of the study

No doubt that waste management in any city has a close relationship to economic, social, health and many other aspects of urban life. Poor management can undermine effort at economic development; increase spreading of diseases and discomfort, but well planning of waste management and recycling activities can provide livelihoods to poor people; enhance the availability of soil and water resource and serve as a model for good governance in other public services. Most exemplary solid waste management systems have come into being as the result of deliberate intervention on the part of one or more stakeholders in waste management that is how have an interest in seeing something happen ***(Scheinberg, Anschutz, and Josse, 2004).***

According to ***Ministry of Environmental Affairs*** (MOEA) ***and Egyptian Environmental Affairs Agency*** (EEAA) ***(2007),*** the proper collection, treatment and disposal of the increasing amounts of solid waste represent a daily challenge to governorates and municipalities. As uncontrolled disposal and burning of solid wastes constitutes a major environmental problem, the development of environmentally sound solid waste management systems throughout the country, is a high priority of the MOEA and its executive institution, EEAA. The challenge is expected to be met by the development of strategic plans, operational programs, practical guidelines for integrated solid waste management, as well as the conduct of training programs, and the implementation of relevant demonstration projects in partnership with all stakeholders.

In Egypt less than 65% of that waste is managed by either some form of public or private sector collection, and disposal or recycling operation. The remainder accumulates on city streets and at illegal dumping sites. Moreover, the management of this waste remains, for the most part, both inefficient and inadequate. This is the main cause of serious environmental and public health problems. In fact, the improper disposal of solid waste in waterways and drains has lead to the contamination of water supplies, which hinders Egypt's natural resources, heritage, and the health, as well as welfare of its people ***(Zaki, 2010)***.

In Egypt Solid waste management practice has been largely focused on the issues of collection and disposal with little or no attention paid to the health status of WCWs. The collection methods are based mostly on manual labour, which is less costly than the mechanized collection systems adopted in developed countries. Municipal waste management population is between 50,000 and 70,000 .On the other side, the Cairo Cleansing and Beautification Authority was established in 1984, The largest settlement is Mokattam village, nicknamed as "Garbage City," located at the foot of the Mokattam Mountains, next to Manshiyat Naser ***(Wikipedia, 2012).*** The total numbers of WCWs at Al wailly zone in Cairo governorate between 150 and 200WCWs. The Suez Cleansing and Beautification Authority was established in 2011, The total numbers of WCWs at all zones of Suez governorate between 450 and500 WCWs ***(Janitorial Beauty Departments, 2011).***

Solid waste management practice in Egypt has been largely focused on the issues of waste collection and disposal process with little or no attention paid to the health status of the waste collection workers. Moreover, the collection methods are based mostly on manual labor, which is less costly than the mechanized collection systems, which adopted in the developed countries ***(Abou-El-Wafa, 2012).***

Aim of the Study

The study aims to:

Assess the occupational hazards and preventive measures among waste collection workers (street sweepers & waste collectors) through:

- Assessing knowledge of the waste collection workers regarding hazards of waste collection.
- Determining the knowledge of the waste collection workers regarding health related preventive measures.
- Determining practices of the waste collection workers regarding the preventive measures (e.g. wearing protective clothes / devices, etc……).
- Assessing health status of the waste collection workers.
- Identifying the community health services provided for the waste collection workers.

Research questions:

- Does the knowledge level of the waste collection workers affect their practices of waste collection?
- Does the practice of preventive measures affect health status of the waste collection workers?
- Is there any difference between waste collectors and street sweepers regarding health hazards exposure?
- Are the provided community health services adequate to the health needs of the waste collection workers?

Operational definition:

Waste collection workers include both the street sweepers & waste collectors.

Part I:

Nature of Waste and occupational Hazards

Definitions:

An occupation is defined as the principle activity of one's life that he/she engages in to earn money. Every occupation comes along with certain hazards. So one should take the due safety measures in order to safeguard his/her life to understand the various health hazards that different occupations have. A hazard is something that can prove harmful risk if not controlled. In order to measure the risks involved in an occupation, it is necessary to analyze the occupational hazards and implement suitable measures to ensure occupational safety ***(Manali, 2009).***

Therefore, the occupational health aims at promoting and maintaining the highest degree of physical, mental and social well-being of workers in all occupations. The prevention among part time workers from health risks is implemented or achieved by their working conditions. Also, the protection of workers in their employment from risks is resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to physiological and psychological capabilities is to know; what are the hazards in their working area regarding health and safety, which are very essential for everyone ***(ILO, 2009).***

Meanwhile, Hazard is something that can cause harm if not controlled; the outcome is the harm that results from an uncontrolled hazard. Also, a risk is a combination of the probability that a particular outcome will occur and the severity of the harm involved "Hazard", "risk", and "outcome" are used in other fields to describe e.g. environmental damage, or damage to equipment. However, "harm" generally describes the direct or indirect degradation, temporary or permanent, of the physical, mental, or social well-being of workers ***(OSH, 2011).***

Regarding Occupational Health Hazards, the ***ILO (2012)*** reported that occupational hazards are dangers to human health and well being, which are associated with specific occupations. While, efforts are made to reduce hazards, these hazards remain in the workplace by nature of the profession. Occupational hazards may lead to illness, injury, or death. They can include physical risks like falls and exposures to heavy machinery, along with psychological ones such as stress. Furthermore, occupational hazards like exposure to chemical, biological, and radiological agents are also a concern. People who work in jobs with a recognized occupational safety, special training is often provided so that people are made aware of the related hazard.

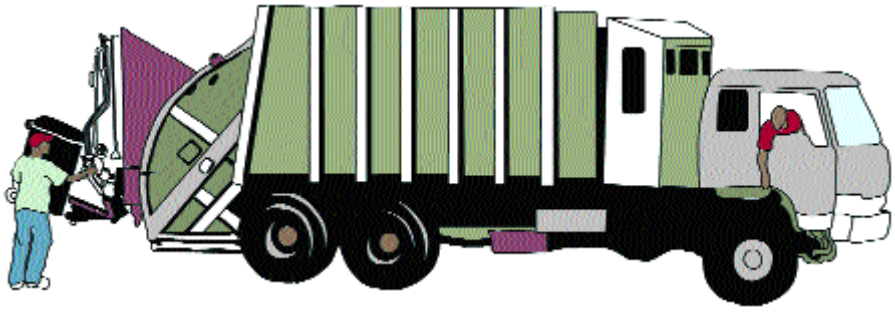

Figure (1): Waste collection.

Regarding waste collection, ***SWANA (2010)*** mentioned that **waste collection** is the first component of waste management, which results in the passage of a waste material from the source of production to either the point of treatment or final disposal. Also, Waste collection includes the curbside collection of recyclable materials that technically are not waste, as part of a municipal landfill diversion. However, in many developing countries, such as Mexico and Egypt, residents must interact with the waste collectors, or else trash is not removed (waste left in bins or bags at the side of the road cannot be expected to be remove**. "Collector"** means any person authorized to gather solid waste from public and private places.

However, **waste collection** is a necessary activity all around the world. Fortunately, for the health and living conditions of inhabitants, there are professional waste collectors. For waste collectors, however, the risk of disease resulting from exposure to various work hazards is high, for

example fatal and non-fatal occupational accidents, Waste collection can be practiced as either an occupation or an essential means of survival. The socioeconomic status of both types of waste collectors is low, and their working conditions are unfavorable. In the occupational setting, however, many preventative measures have been proposed and implemented in order to reduce the risk of accidents and occupational disease. Such measures involve increasing safety and reducing the risk of musculoskeletal, fatigue, respiratory and gastrointestinal disorders ***(Silva et al., 2005).***

Collection of MSW is the responsibility of local municipalities in Egypt. However, in Cairo and in the big cities, waste collection is subcontracted to local waste collector workers and in recent years to private local and multinational companies. The average collection rate in urban areas is 30-77 %, in Cairo it ranges between 0% in the slums and the poor neighborhoods and 90 % in the private residential compounds. The collected waste is disposed in open dumpsites, where scavengers separate recyclable materials ***(Egyptian Environmental Affairs Agency, 2005).***

Figure (2): Street sweeping.

Concerning street sweeping, ***Wikipedia (2012)*** stated that a **street sweeper** or street cleaner may refer to either a person's occupation, or a machine that cleans streets. A street sweeper cleans the streets, usually in an area. They have been employed in cities since sanitation and waste removal became a priority. A Street-sweeping person would use a broom and shovel to clean off litter, animal waste and filth that accumulated on streets**.**

According to ***Sabe and Zodpey (2008)*** Street sweepers play an important role in maintaining the health and hygiene within the cities. This job exposes the street sweepers to a variety of risk factors such as dust, toxins bioaerosols, volatile organic matter and mechanical stress, as well as diesel exhaust pollution, which make them vulnerable to develop certain occupational diseases. The important morbid conditions detected in these workers include the diseases of the respiratory system and eye, accidents, injuries, cut wounds, skin infections, animal bites, etc**.**

However, common waste management practices in the main African cities often include **street sweeping**. It is carried out by a private sector, as well as by municipal public works staff. Street sweeping is most often performed manually. The debris is deposited into public waste receptacles along the street and outside the market place. Collections generally occur at dawn before the commercial centers open and at dusk after these centers have placing the debris at the curb. Municipal street sweepers then clean these common areas and set out the waste for pick up by the collection vehicle ***(labor market information, 2000).***

Types of occupational hazards:

Working condition can lead to either illness or death. Often, people in jobs, which pose high level of risk are paid more than similar, with less risky jobs to compensate for the danger involved .As in other jobs, hazards for construction workers are typically of **four classes**: chemical, physical, biological and social ***(Options Education Org, 2012).***

Chemical hazards are often include airborne, which can appear as dusts, fumes, mists, vapors or gases; thus, exposure usually occurs by inhalation, although some airborne hazards may settle on and be absorbed through the intact skin (e.g., pesticides and some organic solvents). Also, chemical hazards occur in liquid or semi-liquid state (e.g., glues or adhesives, tar) or as powders (e.g., dry cement). So skin contact with chemicals in this state can occur in addition to

possible inhalation of the vapor resulting in systemic poisoning or contact dermatitis. Chemicals might also be ingested with food or water, or might be inhaled by smoking ***(Abou-El-Wafa, 2012)*.**

Regarding **physical hazards, *Chaudhary (2006)*** stated that, these hazards include noise, heat and cold, radiation and vibration. The machines that have transformed construction into an increasingly mechanized activity have also made it increasingly noisy. The sources of noise are engines of all kinds .The principal sources of non-ionizing ultraviolet (UV) radiation are the sun and electric. Additionally exposure to ionizing radiation can occur with x-ray inspection of welds, for example, or it may occur with instruments such as flow meters that use radioactive isotopes. Lasers are becoming more common and may cause injury, especially to the eyes.

Concerning, **biological hazards, *Marder (2006)*** reported that, biological hazards are presented by exposure to infectious microorganisms, to toxic substances of biological origin or animal attacks areas, where these organisms and their insect vectors are prevalent. Attacks by animals are occurring. On the other hand, ***social hazards*** include the location of work and many projects require living in work camps away from home and family, construction workers may lack stability of social support. Features of heavy workload, limited control and limited social support are considered the important factors associated with increased stress. These hazards are common to all WCWs in one way or another**.**